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Technology as an Extension of Personal Capabilities. Reflections for Organizational Development

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Abstract. The present work discusses the importance of the interaction between human beings and technology in the organization. Technology is frequently analyzed at the organizational level from two perspectives. For the Administration, the technology is relevant because it is evident that its use increases production. For Sociology, technology is assumed as a factor that modifies the structure and implies changes in power's formal distribution. This paper exposes the perspective of organizational development provided with an inherent understanding of the human deeper dimensions. If technology is gaze at as an extension of the capabilities of human beings, then the analysis of the organization is improved with a better understanding of how people interact with technology. Whether technology is seen by people as an enhancer of their own faculties, a competitor who displaces them from their tasks, an active collaborator to achieve objectives, or the achiever of what is simply out of reach of the action of the human being; the study of organizational development need to take account of the interaction between people and technology. The people manifest several degrees of appropriation or rejection of technologies into the organization. Beyond what it is technology, a person attributes it meanings. For the members of an organization, sometimes technology represent a form of dehumanization, although in others it signifies a profound expression of their human dimension. This research is an exploration of these nuances in the organization.

Keywords. Organizational development, interaction person-technology, personal meanings in the organization.

1. Background of Technology Analysis in Organizations

The present work is a reflection on how technology can be considered in the analysis of organizational development. Explore the human dimension that exists in technology and the implications in the organizational field.

In the study of organizations, implicitly or explicitly, technology has been considered for the development of administrative and sociological theories. In the so-called Scientific Administration, for example, production processes are considered more efficient if time is reduced and unnecessary movements are eliminated to carry out a task [1]. Calculating how many turns a nut needs to be properly tightened, or how many hammer blows a nail must take to join two planks, involves an interaction between a technological device and an operator. That is, technological resources (tools) and the number of people who operate them (individuals) are considered for an organization to carry out its processes. The main advantage of this model is

its pragmatism. It offers a clear answer to what is best and the most you can do with the resources you have right now. Technology is understood, then, as a guarantor of productivity.

Another recurring perspective in organizational analysis is to understand technology as a determining factor in the distribution of formal power. Although this idea has been more explored from Sociology, it has also been an explanation that has been found independently in the Administrative Disciplines. The assumption that exists one best way to carry out the processes was tested in light of the influence of technology in real and concrete organizations. Thus arose the administrative school known as Theory of Contingency [2]. The desire to understand whether or not specific organizations had the appropriate technology to achieve their objectives and adapt to their environment, gave rise to a series of studies that analyze the relationship between technology and organizational structure, and between the environment and the context of the organization. However, these studies assume that technology is a variable that is not affected by the particularities of the human beings who operate them. From their perspective, technology determines components of the structure such as the appropriate size of the organization, the hierarchical form and the appropriate size of its operating units. In this sense, it is irrelevant what are the specific intentions, illusions or capacities of the people who make up an organization because none of them influences the type of structure. The paradox is that from this point of view it is also not relevant to explain what technology is, or how it manifests itself.

However, these perspectives on what technology is leave unanswered many questions about what it implies in organizational terms. For example, to analyze innovation, it is important to distinguish between the technologies developed by the vision and effort of an individual entrepreneur, those developed as a government strategy and those that arise between creative communities that openly share ideas and projects [3]. There is an active concern to understand the circumstances in which each of them is achieved [4]. On the other hand, from a financial point of view it is relevant to determine whether technological development represents a cost or an investment based on obsolescence. Both issues undoubtedly have organizational implications. However, the questions that give life to this research are these other two.

The first one is what meanings does the use of technology evoke for the specific people who interact with it, and what will be the relevance of these meanings to better understand the dynamics of the organization?

The second, based on these meanings, what is the reason that some technologies have greater potential than others to trigger profound changes in people's activities and habits?

We start from the assumption that these meanings are varied in manifestations and intensities in organizational life. For now, let's explore two possible extreme scenarios. In the first of these, the organization does not have the necessary tools at all or, for some reason, the tools it has are useless to carry out their processes. In other words, there is no adequate technology to tighten nuts or to join planks. This implies a greater physical effort for the individuals dedicated to those tasks and the results are unsatisfactory compared to those obtained the use of tools. It is not impossible to tighten a nut without a suitable wrench, or to join two planks without nails and hammer. But without a doubt, it will always be more productive to have the appropriate technology to carry out a certain type of task. In addition, the effort to find substitutes for a wrench or hammer also involves costs and time. When you are already used to its use, technology is taken for granted in the activities of the organization. In this sense, it is not an exaggeration to affirm that the use of a specific technology is essential for the survival of an organization [5]. And like any factor that helps mere survival, its importance only becomes evident as it begins to be lacking.

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In the second scenario, no individuals are present at all for the completion of the task. In other words, there are only tools. Using programmed mechanisms to activate them, the tools can perform the expected tasks without the direct intervention of an operator. It is the principle of automation. The individual has been displaced and has become apparently unnecessary. Now, although in this case the physical intervention of the human being vanishes, it is evident that to achieve this, it is necessary to make a prior intellectual effort to design those tools or machines that control the other tools. Human intervention to understand and synchronize the sequences of steps that give the right rhythm to actions is still probable. Behind the apparent absence of people in the operation, automation represents the application of intelligence and human skills, at least at some point. In the long run, this way of operating will be more efficient than the effort of the most skilled operator. From a financial point of view, this is the scenario in which an organization's commitment to having a Research and Development department is justified [6]. But mixed feelings are still present: on the one hand, technology has supplanted some individuals accustomed to performing certain tasks, on the other, the technology that replaces them has arisen from the creative potential of other individuals and opens new opportunities for another kind of human talents [7].

Now we can even develop a possible third scenario that is not necessarily an intermediate point between the previous two. Let's go back to the stage where you don't have the right wrench or hammer. Probably the first instinct will be to get substitutes. If there is no time or capital to get them new or borrowed, then it will be thought: what other object in my environment can momentarily serve as a key or hammer? Other creative proposals arise at various levels to go beyond just tightening the nut or hammering a nail. A real solution can arise from the question: How can I couple parts without nuts or nails? Or, can I design this product in any other way than by joining pieces? Even, is it possible to achieve the functionality of a product developing a completely different one? The most radical question in the face of this contingency would be: beyond the product that I offer, can I develop another alternative that satisfies the purpose that has given rise to this organization? Innovation in products and processes, and even in services, business models and forms of distribution, is triggered when looking for answers to these types of questions, either because this scenario is presented in real form, or because it’s developed from the vision of a creative or an innovator mind [6].

Thus, the ways in which the members of an organization relate to technology are broad, dynamic and even contradictory. So, how can the concept of technology be integrated into organizational development? In its current state, Organizational Development draws from motivational and decision theories, that is, positions that analyze the organization based on human behavior. So from this perspective it is not enough to understand the organization from the efficiency of its results, nor from the abstract description of its structure. Their main contribution lies in highlighting the human and personal dynamics of the organization's participants. In an organizational development strategy, it is valuable to understand how meanings are generated and exchanged between the people who make up the organization. Therefore, for this research we start from a definition of technology that encompasses the human dimension. Technology is everything that allows to extend the capabilities of a human being [8]. So, to better understand what technology is, it is necessary to understand more what human beings are.

2. The Notion of Person

Alan Turing proposed a famous thought experiment. Now known as the Turing test, it consists of having a person in a room who communicates to a separate room with two other entities that she or he cannot see. One of the entities in the other room is a person A, and the other is a

computer B. Let's call the first person C. The test is that after talking for a while with A and B, C determine who the person is in the other room. According to Turing's expectations, if it ever happens that for C it's impossible to distinguish between A and B; it can be argued that the point has been reached where a computer has perfectly simulated human intelligence [9]. Beyond that technology has advanced to a point where it no longer sounds so far-fetched that C is unable to distinguish between humans and computers, what is really upsetting about the experiment is to assume that what actually gives us the status of human beings it is not exclusive to us. Already in a second term, although it is no less disturbing, it is the fact that it is also possible to develop this feature artificially. As human beings we instinctively assume that we possess something that makes us unique as individuals and as a species. But what make us human?

There are multiple starting points to try to explain the human dimension. There are mythological, religious, philosophical, biological, psychological, economic, sociological, ethological and evolutionary views and explanations that offer an approximation to what the human being is. In this work we consider it useful to use metaphors to explore their meaning because, although this loses precision, it gains in the richness of the connotations that are valid for glimpsing the exuberance of nuances that the human condition represents. First we want to introduce the notion of person. Above lines we have used the concept of individual when we were referring to managerial theories. That involved the intervention of a member of the human species that could actually be anyone. To speak of individuals, in essence, is to speak of generic, numerable, no differentiable, and substitutable beings. The notion of person implies that we speak of specific human beings where each of them has a unique and unrepeatable combination of human characteristics and experiences [10].

The exploration of what the person is much more sophisticated than what is presented here, and gives rise to important philosophical debates [11]. In this section it's enough to clarify that when we speak of a person, it implies understanding the human being not only from a scientific reductionism (the sum of its atoms, molecules, cells or organs) but rather that which integrates in a single entity a body, a mind, intangible meanings, an own biographical narrative, a network of social relationships, motivations and the vital sense that moves it. The term human being suggests to understand a single denotation valid for an entire species, while the notion of person contains different connotations of what a single human being represents. Its use is convenient because, like all fruitful metaphors, it symbolically evokes the ineffable that is inherent in life experience.

The person is a body: perceives the material world, interacts with tangible reality and uses the resources of matter as an input to maintain it. The person is mind: has a self-consciousness and awareness of the surrounding reality, has reason, constructs active symbols of reality to explain the past and anticipate the future, understands the logic of events and acts with intentions. The person is soul and spirit: experiences the aesthetic manifestation, has motivation, intuition, deeply feelings, aspires to goodness —although soul and spirit are not perfect synonyms, in this case we use then indistinctly because we only want to metaphorically highlight the intangible part of the human being that endows it with profound meanings in the face of the mystery of its existence and of emotions in the day-to-day life—. The person is a here and a now: has specific social, historical, political and cultural circumstances; is a social being. The notion of person implies the singular and unique way in which a human being combines all of it. A person is completely body, completely mind completely soul [12]. In this way we propose in the following table some manifestations of the notion of the human being as a person. We propose it schematically in the next table.

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Table 1. Metaphorical element that constitutes the person (*own elaboration*)

Metaphorical element that constitutes the person	Manifestations of the metaphorical element	External consequences of the manifestation of the metaphorical element
Body	Physical power Sensory capacity Expression of emotions	Transformation of the physical environment
Mind	Reality awareness Self-consciousness Memory Learning Rationality	Understanding of the physical, psychological and social environment
Soul	Emotions Intuition Creativity Knowledge Aesthetic experience Ethical sense	Emotional response to the environment Understanding art Intuition of spirituality
Social being	Relations with other people	Communication Collaboration Conflict

Now, if we consider that technology is an extension of the person, we understand that in some way its use means modifying, amplifying and transforming one's personal identity.

3. Person as Technology and Technology as Person

Below we discuss how the extension of personal capabilities that technology allows encompasses the four metaphorical elements proposed. Body, mid, spirit and social being. Now we discuss how this extension is achieved in each case.

3.1. Extension of Body Capacities

The person is a body. Well, technology can be understood as the extension of the capabilities of that body. In fact, in the chronology of the appearance of disruptive technological developments, it is noted that most of them have been enhancers of our bodily capabilities. Our body vibrates, resonates and shudders at the stimuli of the sensitive world. Technology allows us to extend, improve, and sharpen our perception of that world [13]. It helps us hear better — musical instruments, speakers, headphones, telephones. It helps us to observe more closely — lenses, telescopes, microscopes, monitors, photographs. It helps us to appreciate flavors better and longer —kitchen utensils, containers, tools to combine substances, equipment that keeps food fresh or at a suitable temperature for tasting. It allows us to refine and capture aromas — perfumes, bottles, sprinklers, applicators. It allows us to come into contact with textures and adapt better to the climate —clothing, footwear, fabrics.

Our body also has the capacity to respond to the environment by transforming matter through work and energy. We make sounds, we move and transform natural elements. At the same time,

we interact with the artifacts that are being developed to work with less energy expended. Technology is also what helps us to spread our voice further —writing, microphones, emails. Which allows us to move with more speed or through land that we would not be able to cross otherwise —carriages, cars, boats, ships. Our body interacts with the objects of the world: it catches, loads, transports, throws, part, squeezes, stacks, etc. Of course, technology is everything that makes it easy for us to carry out all these activities —pulleys, levers, pliers, spears, bows, knives, scissors, pliers. And even, technology allows us to conserve our body in better conditions —exercise equipment, improved food, medicines.

3.2. Extension of Mental Capacities

The person is mind. The mind is memory and learning. It is what allows us to own consciousness and the awareness of the external world. It empowers us to be creative and rational [14]. Technology also helps us deepen those gifts. The mind is coordinated with the body for the survival of the human being. Similarly, the technology that enhances mental achievement is sometimes supported by material devices. We can use a rock to give more strength to our fist, but we can also use it as the physical support in which we can engrave a symbol that means something and that we can share with others [15]. The abstract way in which the brain creates symbols can be translated into the physical world to generate a convention: an element of matter will mean something different from what matter is itself. Thus we have the creative potential for an element of the physical world to not only make us stronger, but also smarter [16].

Technology also serves to extend our ability to express ourselves and share meaning. A pencil that allows us trace and share the lines that we previously visualized in the mind, is a technology that also helps us to extend our mental capacity. Technology eases us to memorize more efficiently and even reliefs us to avoid worrying about possible forgetfulness —writing, paper, books, computers, recorders, data storage units. And it gives us a better awareness of our environment and ourselves —mirrors, lenses, cameras, recorders.

3.3. Extension of Spiritual Capacities

The person is spirit. In a naive way, sometimes we longed for better times, those in which we believe that we did not depend on technology. In fact, it is highly unlikely that anyone has actually experienced life without clothing, without heated and prepared food, or without everyday objects: a bag, a key, a pin, a comb, a card, etc. Each object represents a technological development [17]. Every time we use that object we increase its potential as meaning trigger for us. Each object we have used has the power to evoke memories, it drives our imagination with possibilities of what we can be, and represents an allegory of how we operate in the world [18].

Without technology there is no way to transform the active symbols of our mind into shared symbols [19]. All effective communication of our mental ideas involves a degree of technology. It is the reason why technology is also a way in which we transform what we imagine, what excites us and what we discover. Technology is inextricably linked to art [20]. Through devices, artifacts and material devices ideas are expressed in books, movies, paintings, sculptures, videos, video games, songs, etc. Even the spread of oral traditions and the symbolic, mythical, and spiritual meanings they possess is best guaranteed if there is any technology for their preservation. Think, for example, of how poems, which are initially created orally and remembered with mental resources like repetition and rhyme, come closer to immortality if they are written [21]. Although the power to grasp the mystery of life, to imitate nature, to celebrate beauty, to evoke the subtle and the ineffable, to reflect on the shadows of the human condition, or to shape emotions, belongs to the domain of art; this power would not be possible at all

without the support of technology. First, because thanks to technology it is possible to capture it in a concrete way. Second because thanks to technology it is possible to share it and spread it through time and space. Technology and art go hand in hand in the spiritual development of the species [22]. Each person decides in what ways and with what intensity they expose themselves to their combined influence to shape and dynamism their own spiritual journey.

3.4. Extension of Social Capacities

Technology has facilitated a group spirit that goes beyond the tribe [23]. The narratives that have allowed broad groups of people to gather in communities, villages, societies, organizations and nations are reinforced by the interaction between art and technology. Technology is also a facilitator to communicate and share meanings —signs, mail, newspapers, radio, telegram, telephone, cinema, television, internet, digital videos, social networks. Nowadays, after countless generations in which subsistence required mainly physical and natural inputs and resources, the knowledge —something intangible— has become the essential resource that enables the generation of wealth. This has been possible thanks to technology [24]. The group of solutions that have been developed to help us in the management of knowledge and its dissemination in the contemporary world, are known as Information and Communication Technologies, ICT.

This kind of technology is designed to transform something very subtle: the way we think and communicate. The raw material that feeds this technology is something intangible in the first place; the information [25]. We talk about the manipulation and transformation of symbols from which all our interpretations of reality are made. Human life is largely spent trying to understand, modify and imitate reality. However, reality as such is ungraspable and what we do to manipulate, recreate and account for it is to translate it into symbols. These symbols inform us about what reality is, that is why they make up the universe of "information".

It's important to establish what is the relationship between information and the real world —or if you prefer, what we understand by the real world according to what we perceive from the material universe. It's common to assign the information the character of "true" and "objective" when it seems to correspond to the reality, and instead it's considered "false" when it doesn't correspond, or "subjective" if there is no consensus evidence among a group about of its relationship with the universe of the real. However, the bridge we create between symbols and reality itself is an intuitive resource [26]. Building the bridge is a creative act powered by technology.

What makes technologies that help extend social capacities special is the way in which they create a space where many people can participate by sharing symbols, contributing ideas, improving existing content, and generating new ways of interrelating. Writing, printing and ICT share this essence, although with different degrees of penetration among humanity. What makes ICT different is precisely the depth of these characteristics:

- The possibility for more people to get actively involved in its contents is greater because every time less technical specialization is required for its use.
- Abate the problem of physical distances between their participants.
- It brings those interested in a subject into more "horizontal" contact, that is, there is a greater possibility of exchanging information and establishing relationships based on common interests and not by rituals established by hierarchies or tradition [27].

Another manifestation that makes ICT different from writing or printing (if not always in class, at least in degree) is its ability to offer linguistic, numerical, musical, visual information very quickly and simultaneously —although inevitably in a fragmentary way. The

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communication that it enhances does not exclusively privilege the rational response of the user, but also its intuitive part and its emotional response [25].

3.5. Correspondence between Technologies and Person

As a synthesis of this section, two tables are offered with correspondences and similarities between technology and the manifestations of the metaphorical elements that constitute the person. Although in no case the correspondences imply a perfect and unbroken relationship between people and technology, it's considered that highlighting the similarity between both is useful to later explain the nuances with which people interact with different technological developments.

Table 2. Metaphorical element that constitutes the person (*own elaboration*)

Metaphorical element that constitutes the person	Metaphorical correspondence in technological terms
Body	Machine. *A physical system that processes inputs to transform it into outputs*
Mind	Computer. *It's supported by a physical device or hardware —just as the mind is supported by a physical brain is the brain for the mind— but its greatest manifestation lies in the operating system, the software and programs with which it memorizes, learns, calculates and creates*
Spirit	Algorithm. *Intangible item, the program or software designed to perform a task that may be sophisticated enough to suit your environment to fine-tune their responses*
Social being	Social network. *Application that creates a space in which a person can share a common interest with other people*

In the next table, the examples illustrating each technological manifestation are not exhaustive. There is more than one aspect of personal capabilities that can be encompassed by a single technology. The list is offered to make the reader aware of how the quality of personal abilities are enhanced with real and specific technologies. Obviously, the internal consistency of each stated technological development is very diverse. Some technologies involve the combination of many other previous technologies and some of them are supported not only in material devices, but in social and cultural conventions that make them possible. What we want to illustrate is not the quality of each technology itself, but what it can mean for a person regarding how they expand their own identity.

Table 3. Examples of technology as extension of personal capacities (*own elaboration*)

Person-technology metaphorical correspondence	Manifestations of the metaphorical element	Examples of concrete technologies that enhance the manifestation of the metaphorical element
Body-Machine	Physical power	Lever, pulley, wedge, screw, gear, inclined plane, drill, wheel, ax, fire domain, hammer, architecture, metal

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		casting, wrenches, plow, mill, bags, pins, glasses, weapons, gunpowder, steam engine, rotary, barbed wire, atomic bomb, means of transport, battery, motors, transformers, air conditioning, rockets, spaceships, antibiotics, contraceptive pill, nanotechnologies, laser, microwave oven, polymers, glues, adhesives, Velcro, Kevlar, robots, particle accelerator, 3D printers, drones, bionic parts, organ transplants, assisted reproduction, solar panels
	Sensory capacity	Lens, microscope, telescope, magnifying glass, candle bulb, headphones, pottery, development of cooking and gastronomy, pills, milk formula, precooked food, clothing, textile technology, plastic, electronic sensors, virtual reality, internet of things
	Expression of emotions	Photography, cinematograph, audio and video recordings, android robots, psychiatric medications
Mind-Computer	Reality awareness	Genetic editing, internet of things, sensors, keyboard, mouse, monitors, oscilloscopes, radar, sonar
	Self-consciousness	Printing, operating system, assembly language, HTML protocol
	Memory	Clay tablets, papyrus, scrolls, books, recorders, discs, cassettes, videos, RAM, ROM, USB, cloud storage, post-its
	Learning	File ordering system, clock, compass, astrolabe, double-entry bookkeeping, market research, word processors, spreadsheets, applications, internet protocols, search engines, video games, department stores, merchandise containers, code bar, compiler, factories, radar, algorithms for proposing playlists, GPS and vehicular traffic analysis applications, Apps for transportation services, lodging and food delivery
	Rationality	Abacus, calculator, filing cabinets, cryptography, programming, clock mechanisms, design programs, computer, PC, audio and video mixing programs, artificial intelligence, blockchain
Spirit-Algorithm	Emotions	Pencil, pen, brushes, chisel, musical instruments, printing press, paints, colors, playing cards, photo camera, radio, cinema
	Intuition	

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		Industrial design, iPhone, text auto-correction algorithms, facial recognition, song recognition, predictors of consumption habits, smart architecture
	Creativity	Toys, musical, architectural, literary, cinematographic and pictorial genres, creative industries, video games, digital entertainment and creativity applications
	Knowledge	Libraries, statistical techniques, encyclopedias, research and design departments, wiki pages, blogs, vlogs, Wikipedia, virtual classrooms
	Aesthetic experience	Shaver, makeup, buttons, scarves, novels, mirror, poems, plays, movies, photographs, paintings, musical works, sculptures, video games, radio and television shows, records, streaming platforms
	Ethical sense	*Depends on the procedure and intention with which all other listed technologies are used*
Social being-Social network	Relations with other people	Tubes, plugs, cables, money, shops, schools, hospitals, passport, property registration, welfare state, cold supply chains, limited partnerships, newspapers, consulting, public relations, intellectual property, bank, financial and tax systems , drainage and drinking water system, electrification system, digital interconnection system, insurance, WEB, digital social networks

4. Forms of Interrelation between People and Technology

The definition of technology as an extension of personal capabilities implies that technological developments are in some way an image of people and, therefore, expressions of their human dimension. However, this idea, like any metaphor, has limits that must be noted. Thanks to the wheel, it is possible to build technologies that allow us to move faster. A skateboard allows us to go sooner than the power of our legs. However, note that the similarity between the physical principle that allows the movement of a wheel and the one that allows the movement of human legs is practically nil. That is, although technology allows us to achieve the same goals that we aspire to reach with our bodies, it achieves this in a completely different way than we could accomplish them [28].

Indeed, the wheel with axle, for example, not only does not represent any simile with the human body, but it doesn't even resemble any element that we can identify in nature. From this perspective, we can categorize different ways in which people interrelate with technology. We propose four distinctions of how the human quality in technology is perceived. This reflects more how a technology is appreciated subjectively for what it represents in people's lives, than for what it is objectively in itself.

4.1. Humanizing Technology

The first is when technology smoothly represents an improvement in a person's abilities. For this reason, a «human» quality is attributed to this type of technology that is explained by how people manage to get used to it and appropriate its advantages. This applies both at the species and individual level. Even though a significant percentage of the current population does not

have drainage and drinking water services and therefore do not have the experience of knowing its advantages, it is clear that, among those who do, this technological development is no longer seen as something to hinder them. Nobody, among those who are already used to this type of services, will say that their use "dehumanizes" them. In principle, the so-called widespread use technologies (health systems, drainage, electrical installations, telephone and internet services) represent important transformations that end up being accepted because they represent noticeable improvements in the living standards of the population [29].

Likewise, a person accustomed to using glasses to see better will feel vulnerable when she or he forgets to put them. In fact, it is quite possible that at first the use of glasses is an uncomfortable experience. There is a rejection because it affects even the physical aspect and self-esteem. However, once the person has become accustomed to them and recognized its benefits, it will be very natural understand that glasses do not detract in any way from the human condition and, instead, improve the life experience [8].

4.2. Dehumanizing Technology

The second category of interrelation between person and technology is that in which there is a perception that technological developments harm the human condition. This can manifest itself in various ways. The first is dehumanization in the sense that technology is used directly to displace specific humans. It is also perceived as dehumanizing when technology not only competes, but irreversibly wins in areas where people feel essential, leaving them unprotected. Here, too, habituation can occur as a species, but among those who experience transformation as a direct attack on their way of life, the sense of rejection is natural [7].

Another manifestation of dehumanizing technology is one in which the human being literally or metaphorically becomes an appendix to the machine. Exemplified as a farce in Chaplin's *Modern Times* film, people can become slaves to machinery and algorithms that demand attention, maintenance, endless completion of routine tasks, and unreasonable efforts to keep them active. Indeed, the myth of Sisyphus who is punished by pushing a rock along a huge slope until the rock falls from the top of a mountain, only to resume that absurd task over and over again, reflects many jobs in which it seems like a nut needs to be eternally tightened, or where monitoring a program is required to ensure that the same routine runs correctly over and over again. What is dehumanizing in this kind of technology lies in how it deprives people of living a greater number of experiences, of attending to a greater number of interests and of giving up other yearnings. In any case, it should not be forgotten that many times it is not because of technology, but that the main responsibility for these situations lies in poor organizational dynamics [30].

Here, ethical assessment does play a very important role. For example, reproductive, cosmetic surgery, or genetic editing technologies that lead to an improvement in offspring, appearance, or genetic capabilities are among other reasons, because they are accessible only to those with the financial resources to pay for them. Furthermore, there is a feeling that they are technologies that go beyond what a human should do [31].

Another example is algorithm technologies that can make much more correct rational decisions compared to people. Human beings make decisions based not only on rational calculations, but on the endowment of meaning that we give to the facts and objects involved, in the aversion to loss [32], in the memory and future narration that an experience promises us [33]. Still, the existence of programs and applications that decide for us, be it for our benefit, is perceived as an attack on our human dimension.

Hand in hand with the above, although it sounds contradictory, it has been argued that in the obsession to make the human being the center of the meaning of life, technologies have been

developed that promise to reduce hunger, war, disease and even death. From this perspective, this type of technology paradoxically dehumanizes us because it deprives us of a vital journey in which we are enriched by the understanding and acceptance of our natural limits which gives us a deeper and more significant wisdom [34].

Finally, in this perception of dehumanizing technologies are included those that take human qualities and transfer them to non-human artifacts [35]. As the Turing test hints, the threat is that technology will transfer the best and most endearing of our qualities —intelligence, creativity, empathy, resilience— to artificial entities. And in the worst case, these entities will develop those qualities more fruitfully than we do, so we will become more and more dependent on them.

4.3. Technologies Beyond Human

There is a type of technology that escapes a narrow vision of the definition of technology as an extension of personal capabilities. It's one that allows to achieve experiences that are beyond the spectrum of human sensitivity. Humans only perceive a range of light; we do not perceive with the naked eye what is beyond the infrared or ultraviolet. The wavelength with which our sight operates does not allow us to see molecules, atoms or sub particles. The range of sounds that we can perceive is also limited. We are also unwilling to easily exit beyond our atmosphere, and the temperature and pressure ranges we survive at are limited [36]. Therefore, any technology that allows us to go beyond the limits of our sensory perception can be considered as technologies that go beyond the human.

It is evident that it is a human achievement to have developed the science and technology that allow us to understand these scenarios outside of human experience. But at the moment there is no human way to experience at a sensorial level what happens on a micro and macro cosmic level [37]. In other words, in this section we call technologies beyond the human that cannot be fully experienced (in body, mind and soul) by a person and therefore the full meaning of the experience cannot be shared at the social level.

Technologies for particle acceleration, robots that withstand extreme temperatures and pressures, telescopes that capture microwave signals; they are all technologies that have allowed us to explore phenomena in domains that go far beyond our daily references [35]. To approach these findings in a way that is familiar to our understanding, highly specialized technical languages must be mastered or, in most cases, intuited from narratives that necessarily reduce and simplify and distort their fullest meaning [38]. Although their understanding is within the reach of our rationality, as people we are totally deprived of fully experiencing what happens in those dimensions.

On the other hand, although people possess abilities and capacities, there are technologies that allow multitudes of data to be interwoven in different areas that far exceed human calculation capacity and therefore offer answers that break with what intuitively a person would suppose correct. In fact, the statistical inference capacities of the human being are often exceeded by their tendency to respond intuitively and heuristically to various everyday situations. It is speculated that this is so, because evolutionarily it is much more efficient to respond quickly to a stimulus than to make laborious mental calculations. And, although this cognitive simplification is most of the time successful, it does not stop causing errors [33]. Well, other types of technologies to which we can assign a category that goes beyond the human are those that far exceed the personal capacity to systematize, calculate, evaluate alternatives, etc.

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4.4. Collaboration between Person and Technology

To close this section, we propose that the people-technology relationship is a key principle of organizational development. Finally, the most fruitful uses of technology occur when people collaborate harmoniously with technology. Although not all technologies have been appropriated enough by people, it is important to overcome the idea that they are made to replace us.

One of the fears caused by the use of technology is that human capacities will be stunted. Muscle tone is lost due to lack of exercise and there is no need to exercise if we can move and move using machines. Intelligence loses acuity if it is not used to solve logical problems, but there is little incentive to do so if there is already a computer program that knows the answer —dehumanizing technology—. In the organization, this phenomenon is seen in the disinterest of the people who perform mechanically processes without any interest in its purpose.

The harmony between people and technology manifests itself as something that humanizes when its use helps us to overcome our inherent capacities in ways that allow us to feel fuller. An apparatus is used to exercise and improve health, or a computer to make an iterative calculation that solves a problem to expand knowledge —humanizing technology—. The people who are actively trained in the organization for the best use of a technology illustrate this situation.

Technology helps to compensate for the disabilities of a specific person. There is technology designed to overcome all kinds of disabilities. And technologies designed as collaborative tools to facilitate the interaction of more people and take better advantage of their variety of skills —technology beyond the human—. The greater the degree to which people are involved in the organizational purpose, the more likely this type of synergy with technology will emerge [25].

The following table synthesizes through the use of metaphors, the concepts that we have presented in this section, as well as concrete examples of technology that illustrate each point.

Table 4. Interactions person-technology (*own elaboration*)

Technological metaphor	Humanizing technology	Dehumanizing technology	Technology Beyond Human	Harmonious collaboration
Machine	Tractor	Tank	Nano-robot	Mechanical respirator
Computer	PC	Phishing algorithm	Cyborg	Quantum computer
Algorithm	Block programming	Spying web pages	Search engine	Visual programming
Social network	Used to maintain contact with loved ones	Used to trolley and exacerbate discrimination	Automatic facial and geographic location identification	Space for collaboration, learning and creativity

5. Metaphors person-technology in the organization

In this last section we want to combine what has been stated so far with principles of organizational development. In particular, we will use the proposal for the evolution of organizational paradigms proposed by Frederic Laloux [39]. He proposes five organizational

paradigms according to how beneficial their social purpose is and the degree to which they integrate people and allow them to fully realize themselves. For each paradigm a color is proposed to facilitate memorization. The following table summarizes his proposal.

Table 5. Evolution of organizations [39] (*reworking*)

Organizational model or paradigm	Guide metaphor	Characteristics	Revolutionary advances
Red	A wolf pack	Constant exercise of power. Obedience and agglutination around fear. Reactive, short-term, thrive in turbulent environments	Division of Labor Command authority
Amber	An army	Highly formalized. Highly vertical hierarchies. Stability and rigor are valued. Rigorous and cyclical processes. Stable and scalable hierarchies, long-term perspective	Formal functions, roles Processes
Orange	A machine	Competitive, looking for profit and growth. They innovate in products and processes. Management of objectives. Control over «what to do», freedom over «how to do». Prediction and control	Spirit of innovation Defined responsibilities Recognition of merit based on benefits
Green	A family	Pyramid structures focused on culture and empowerment. Based on common interests, they achieve employee motivation and commitment	Empowerment Culture driven by values Stakeholders model
Teal	A living organism	More horizontal structures and organic hierarchies (based on interest and skill, not power). Trust in people and their integrity. They are dynamically guided by their process	Evolutionary purpose Personal fulfillment Self-managed groups

Based on the above, we propose what is the expectation of each type of organization regarding the use of technology in the next table.

Table 6. Human-technology interactions in the organization (own elaboration)

Type of organization [39]	Ways of using technology as a personal extension	Person-technology relationships
Red	***Body***: ostentation of power ***Social***: spread of fear in groups	***Dehumanizing***: use of weapons and resources to submit wills

Amber	***Body***: discipline and use of physical space ***Mind***: devices to implement rules and keep them running ***Spirit***: construction of narratives that give coherence and belonged to the group ***Social***: propagation of the rules, mechanisms of climbing steps in the hierarchy	***Dehumanizing***: rules above people ***Humanizing***: design of rules and processes that dilute fear ***Harmonic collaboration***: effective propagation of the vision of the vision of the organization
Orange	***Body***: efficient transformation of resources ***Mind***: systematization of processes and strategies ***Spirit***: advertising mechanisms, marketing, innovation ***Social***: market research, building customer loyalty	***Dehumanizing***: ostentation of status and transgression ***Humanizing***: innovation in ideas, products and services, stimulation of creativity in pursuit of organizational objectives ***Beyond human***: experimentation to break known limits ***Harmonic collaboration***: inventions, tangible and intangible innovations, generation of wealth
Green	***Body***: extension of the voice that formulates an ideal ***Mind***: construction of narratives that get adherents to a cause ***Spirit***: search for empowerment, identification with common interests ***Social***: proselytizing for new adherents, confrontation with rival ideologies	***Dehumanizing***: prejudices based on membership in communities, reinforcement of group thinking ***Humanizing***: recognition of just causes and the need for social improvements ***Beyond human***: perception of technology as something alien that transgresses human dignity ***Harmonic collaboration***: affective and effective communication with people with common interests
Teal	***Body***: transformation of resources into products and services ***Mind***: application of creativity in the creation of products and services ***Spirit***: application of creativity to give personal meaning to the products and services offered ***Social***: application of creativity to achieve purposes that enrich the quality of society's life	***Dehumanizing***: Subtle process of weighing the importance of technology in the abstract ahead of that of concrete people ***Humanizing***: technology as an enhancer of creativity, collaboration and empathy ***Beyond human***: expanding the limits of what is human to a better understanding of ourselves ***Harmonic collaboration***: to foster

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		and develop creativity and as a resource to collaborate and generate a more comprehensive spirit of innovation

Finally, we consider what are the person-technology interactions that can be fostered in a loyal organization, that is, one with a high degree of organizational development where the search for personal fulfillment, the organizational objective and social sustainability are aligned.

Table 7. Technology for organizational development (*own elaboration*)

Axis of vital dynamics in a teal organization [39]	Aspects covered by the axis [39]	Purpose of using technology for organizational development
Organization structure	Power distribution Coordination Projects Staff functions	Tool for a horizontal design made up of work teams. Support in the generation of organic and dynamic hierarchies based on interests, intelligences, skills, abilities and sensitivities [40]
Human Resources	Recruitment Incorporation Training Job titles and job descriptions Individual purpose Flexibility and time commitment Performance management Retribution Assignments and promotions Layoffs and dismissals	Tool for generating synergies from a balanced combination of intelligence, imagination, intervention, involvement and integration of staff. Promotion of the use and enrichment of systematization of internal knowledge, science, humanism, creativity and action in the face of problems, challenges, challenges and opportunities [25]
Daily life	Office spaces Meetings Decision making Conflicts Information flow Values Reflection spaces Mood management Community building	Generation of motivating atmospheres from sensory stimuli [41]. Reinforcements for teamwork and integration dynamics. Promotion of internal communication, empathy, assertiveness and effective collaboration [42].
Large organizational processes	Purpose Strategy Innovation and	Promotion of the generation of rational, intuitive and emotional knowledge [43]. Tool for appropriation of knowledge at

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development of products / services Supplier management Purchases and investments Sales and marketing Planning, budgets and control Environmental and social initiatives Change management Crisis management	personal, group, organizational level and its dissemination in the environment [25].

5. Final Thoughts

I

Technology has been considered in organizational analysis thinking about it in terms of productivity, its financial relevance —if it represents a cost or an investment— or its influence on the structure —in how it modifies the distribution of formal power of an organization—. On the other hand, in the field of organizational development and schools of behavior and new human relations, it has been studied how people influence the dynamics of the organization [44]. It is important to consider technology as a factor that influences personal motivations, decisions and behaviors. In this work we have proposed to understand technology from the meanings it generates among the people who use it for the benefit of authentic organizational development. Interaction with technology is inherent in the vital sense that members of an organization generate. Technology is not for people just what it was developed for, it also evokes deeper meanings. The definition of technology as an extension of personal capabilities has allowed us to glimpse how these meanings also refer to the identity of each person who participates in the organization.

II

In our argument we have given concrete examples of technological developments. It can be controversial to say that money or the Welfare State is a technology like the wheel or the phone. However, it is easy to recognize the algorithms that run on smartphones as a technology, even though they are as intangible as money or the Welfare State. What we are talking about is that there are immaterial technologies, developed more from ideas and concepts than from physical resources. We have proposed that there are technologies that extend people's capabilities at the bodily, metal, spiritual and social levels. Similarly, it follows that there are technologies built from each of these four levels. Of course, there are technologies with greater internal consistency and better performance than others. It is evident that money has worked much better as a technology than the Welfare State, although some people think that as an idea it is less beneficial. The degree of quality and impact of a technology can be explained metaphorically from how it extends personal capacities more fully. The operation of an algorithm that runs on a physical support —«body» hardware device—, which streamlines calculations to find patterns among multiple options —«mental» calculations—, which is oriented to an emotional response of the user through attractive design and understanding their preferences behaviors —offering a «spiritual» experience— and nurturing for their refinement the options of hundreds or thousands of users — «social» feedback [21]— is very likely to work better as a technology than a regulation that only speculates with cultural behavior —guided by social conventions—
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III

A very popular reflection on what technology implies, states that if someone is facing a very advanced technological development for which they have no antecedent or explanation, the experience will be equivalent to being in the presence of a manifestation of magic [45]. One of the limitations of the idea of technology as an extension of people's capacities occurs when technology is so far from a person that it does not have possible references to identify with it and, therefore, to elaborate a meaning to link it with its use. One of the challenges for organizations is employing technologies that really trigger people's desire to appropriate them as an extension of themselves [25].

IV

At the other extreme are the technologies that we are already so used to that no one notices them unless they stop operating. From an organizational point of view, this habituation has two advantages. The first is that there is no longer a conscious rejection or suspicion about the use of technological development. No one uses a glass to drink water, thinking longingly, why don't the days when the bowl formed by the clasped hands to drink water return? The second advantage is that technology can condition behavior much better than rules and punishments do [46]. A traffic light at a busy intersection is a much better idea to speed up traffic than a law that spells out when it is time to pass for each car. And even better than relying on the goodwill of every motorist. In fact, this last alternative will sooner or later generate feelings of injustice and conflict.

V

Technology offers the promise of relieving us of tasks that are tedious and for which we respond less smoothly. Some people are suspicious that an algorithm decides for us, for example, when to ingest a medicine that we need [34]. It is worth remembering that this type of scheduled intake is just the type of activity that, according to economic and psychological studies, does not provide us with a greater benefit in terms of experience and vital meaning. More than a conscious action, it is a task that we perform in an automated way. Hence it is so common that we forget to do it [33]. But its forgetfulness if it brings with it consequences that we regret. Hence, when the transgression that a technology represents does not exceed its practical convenience, it is very likely that we assume the use of that technology and eventually value its use as part of who we are. To a large extent, this accentuates the irony that technologies are used to denigrate the dangers posed by the technologies themselves. For example, social networks [21]. The foregoing does not prevent us from being attentive to what may enslave us in the use of technology. In fact, many algorithms -mind- are much more efficient than robots -body. Therefore, it is a real possibility that the programs are the ones that direct and coordinate and the people that make the physical effort [7]. Just the opposite of what the idealization of technology implies.

VI

Technology and the changes it represents have always been very suspicious among people accustomed to a way of doing things. Abel and Cain's account is an echo of the reluctance that agriculture caused among nomadic herders [46]. Plato in his dialogue *Phaedrus* denies writing because it weakens the human capacity to memorize [47]. In the metaphor of technology as an extension of the person, it should not be forgotten that sometimes the feeling caused by a technological change is not one of addition, but of subtraction [7]. That invention takes away

something that defines me and gives me meaning. While this should not be underestimated, it must also be considered that at some level, someone will add technological change. Many times unexpectedly and in other areas. The spread of the use of medicines, and in particular vaccines, caused a noticeable improvement in life expectancy [29]. But also in education and at work [48]. Longer lives mean more time to study and the possibility of postponing entry to the labor market for more years. The invention and popularization of the car, helped young people to have a space for the exploration of their sexuality outside the severe gaze of adults. With all of the above, the concept of youth emerged as a time of life different from childhood and adulthood [49]. For its part, the contraceptive pill changed the attitude of women with regard to their reproductive capacity even more noticeably. By having more control in their decisions, the woman became empowered. And that power in itself - pragmatic and concrete - has probably been much more transformative for his intimate, family and social life than all the academic theories and efforts of activist leaders who have fought for more rights and opportunities [7]. Organizational development must also consider human-technology interaction in a much larger social space than that of the organization itself.

VII

One of the key challenges of organizational development is transcending the idea of individuals and assimilating the notion of people as a more fruitful and fair reference to what human beings are. The personalization of technology, that is to say, the effort of people so that their workspaces, their tools, and computer programs have a unique and singular appearance, is a reflection of the way in which they identify technology as an extension of his own self. The last reflection that we offer is that the organization itself can be understood as a technology. Technology is an extension of personal capacities and in its use there are inherent possibilities to modify one's identity - narrations that respond to who I am, where I come from, what I aspire to achieve. If we can extend beyond what is our body, our mind, our spirit or our circle of social support; so it means that each one of us as a person means more than the limits of that body, mind, spirit and interpersonal relationships [50]. The symbolic power contained in technology is triggered not necessarily by its function itself, but rather by what its meaning implies to us. It turns out that organization is also a space where our bodily, mental, spiritual and social capacities can be extended. Although some perspectives of organizational development are articulated from a contrary sense -people must be at the service of the organization-, it is worth identifying that, for our unique condition of person, the same organization is a technology that can be used to deepen our human dimension.

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